

CASA-CQUEST Modeling for Carbon Cycle Assessments in Forested Ecosystems of the United States

Christopher Potter

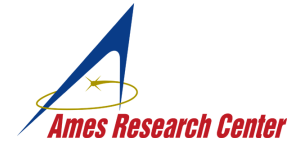
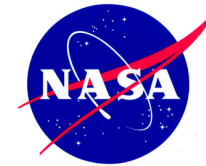
Principal Investigator (PI)

Senior Research Scientist, NASA Ames Research Center

Co-Investigators at California State University Monterey Bay:

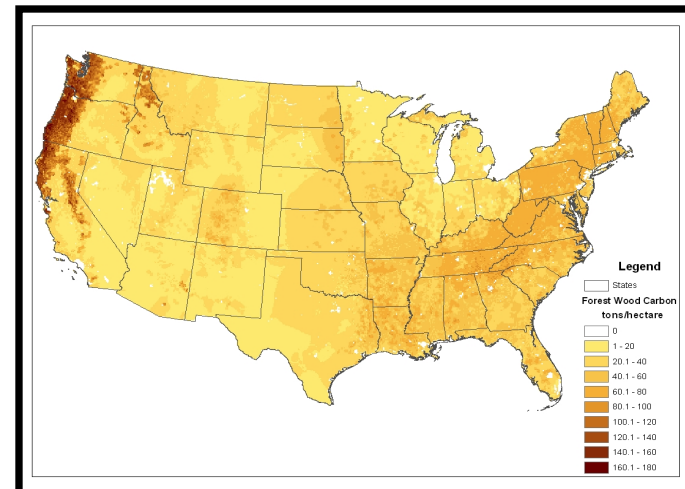
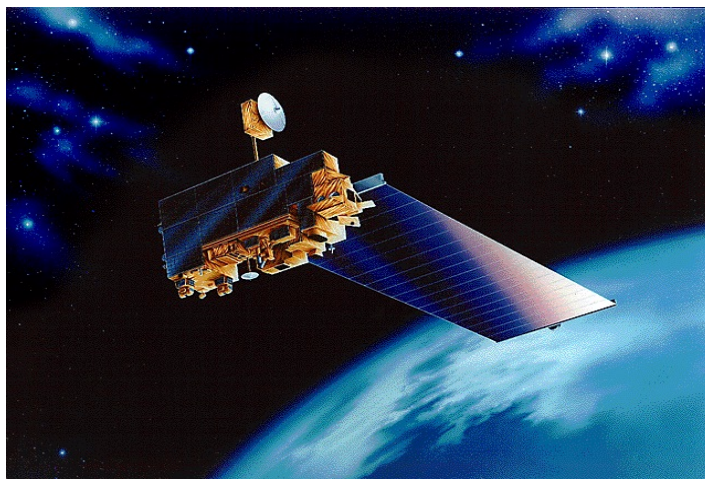
Steven Klooster, Vanessa Genovese, Shuang Li (NPP),

Cyrus Hiatt, John Shupe



National Climate Assessment

NASA Products and Capabilities



INDICATORS

Monitoring

Diagnostics

Well-Being

CLIMATE CHANGE

LAND COVER CHANGE

Air Temperature ↔ Wildfire
Moisture Availability ↔ Grazing Management
Solar Irradiance ↔ Cropping Practices
Heat Flux ↔ (Ex-)Urban Sprawl
Wind Speed ↔ Insect/Pathogen Populations

Snow Pack / Snow Water Equivalent
Energy Balance / Surface Albedo
River/Reservoir Water Quantity and Quality
Soil Degradation and Erosion
Woody Vegetation Mortality / Regeneration

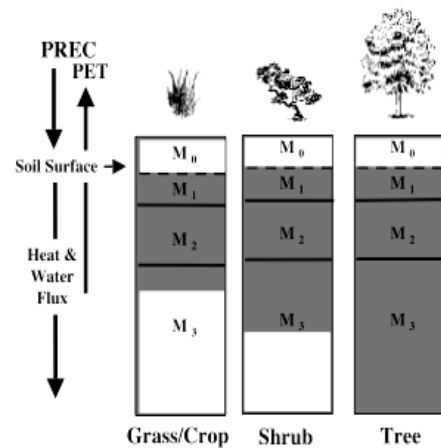
Productivity
Habitability
Adaptability

NASA Ames CASA Model Validation

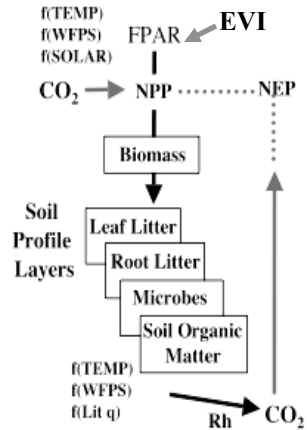
Potter et al. (2012) *International Journal of Geosciences*

C. Potter et al. / *Global and Planetary Change* 39 (2003) 201–213

(a) Soil Moisture Balance and Plant Functional Types



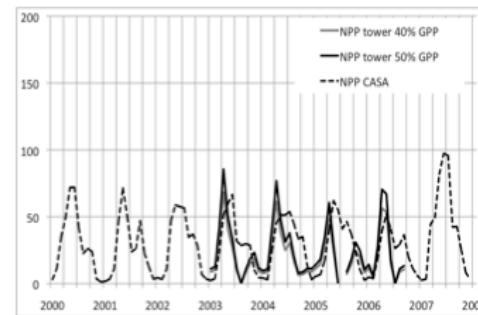
(b) Ecosystem Production Nutrient Mineralization



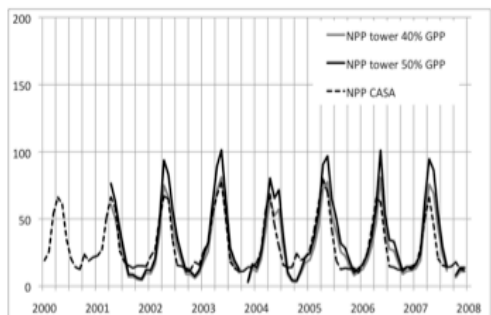
$$NPP = Sr * EVI * e_{max} * T * W$$

Comparison of CASA NPP to Ameriflux tower measurements for corresponding monthly fluxes. $R^2 = 0.77$ for all sites combined.

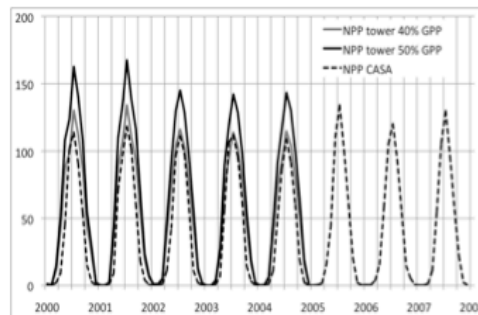
a. ARM SGP Mixed Cropland



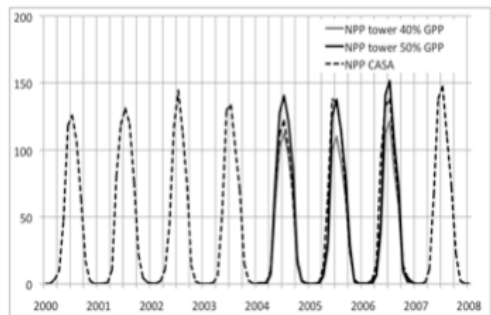
b. Tonzi Savanna Grassland

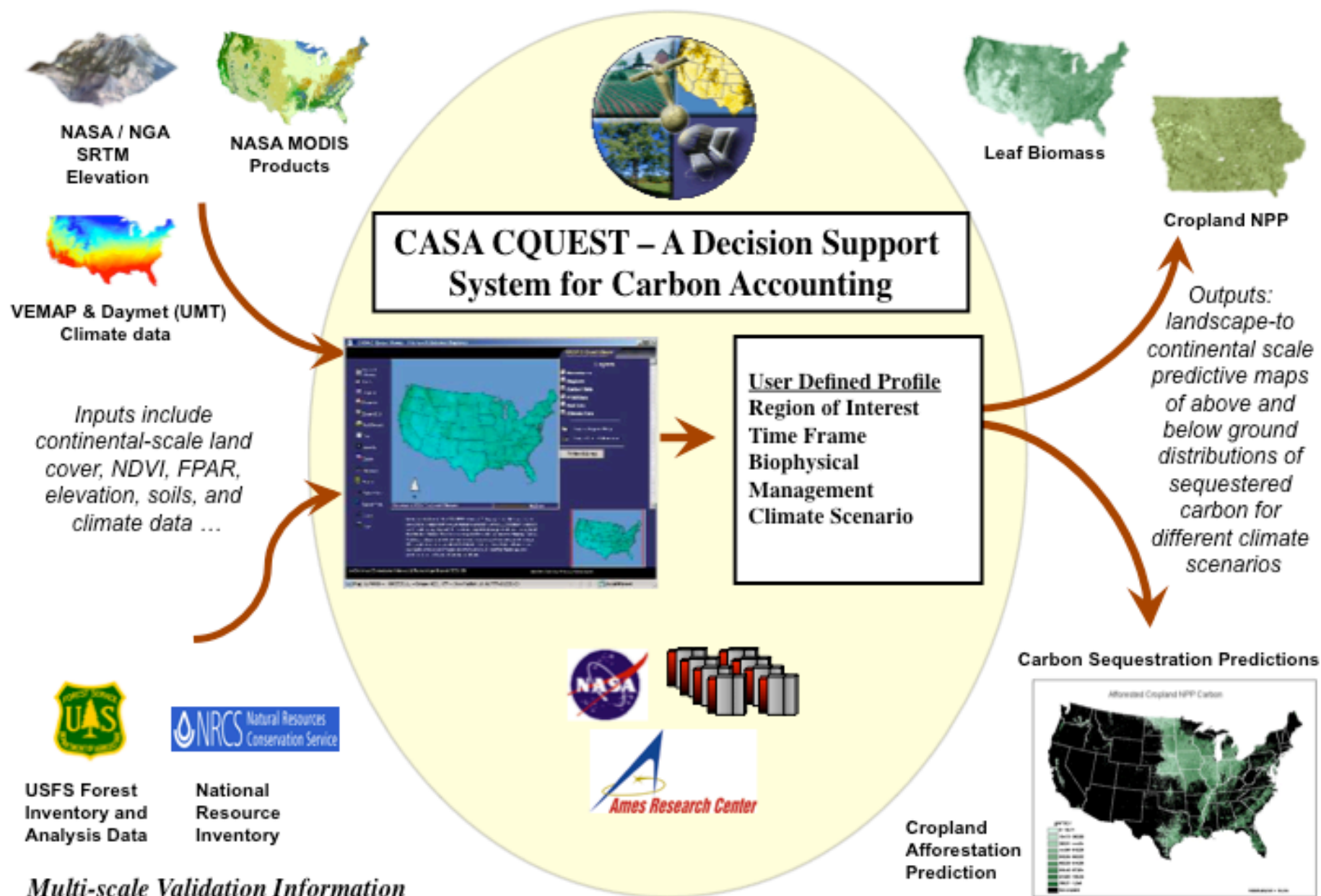


c. Howland Mixed Forest

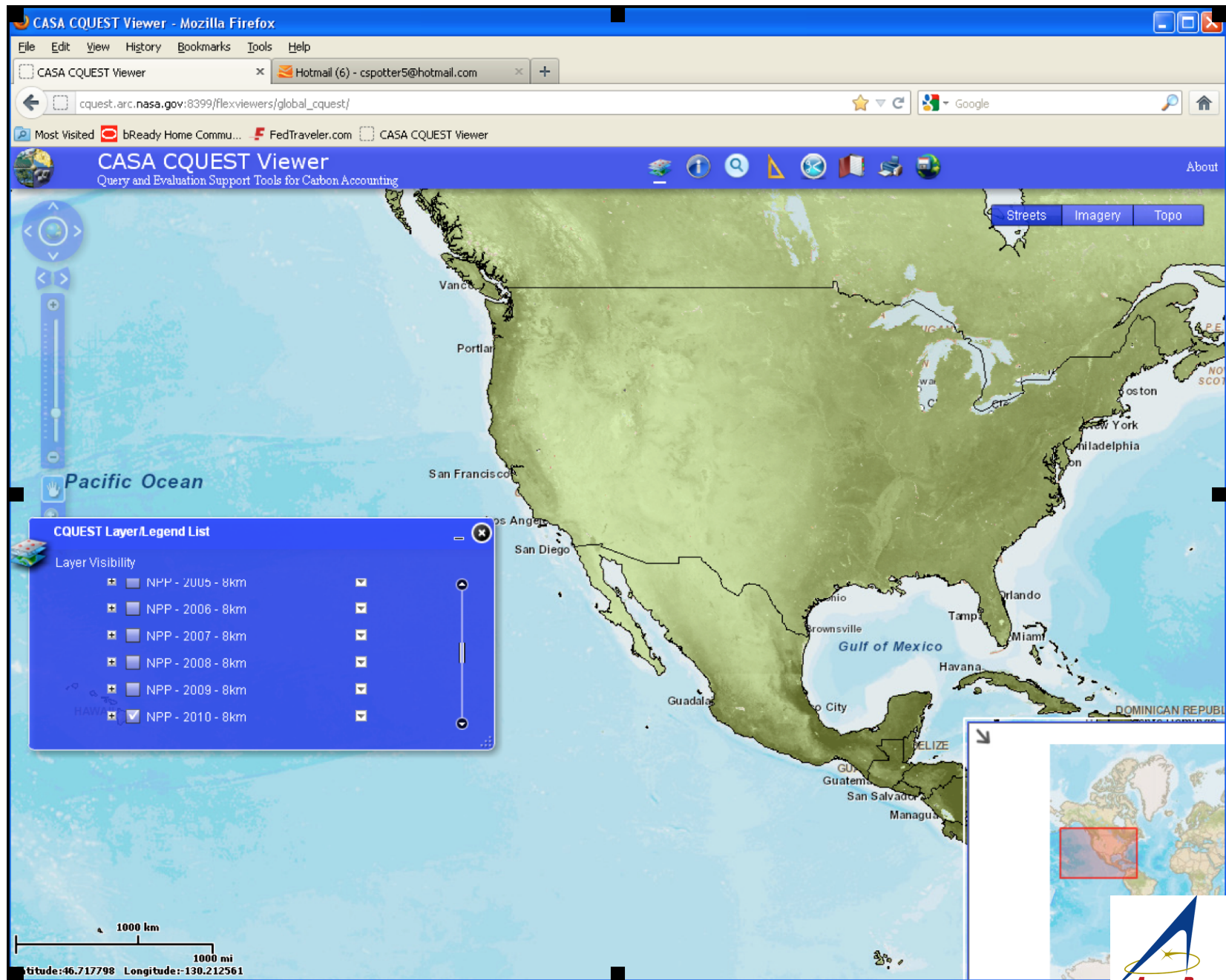


d. Bartlett Deciduous Broad-leaf Forest



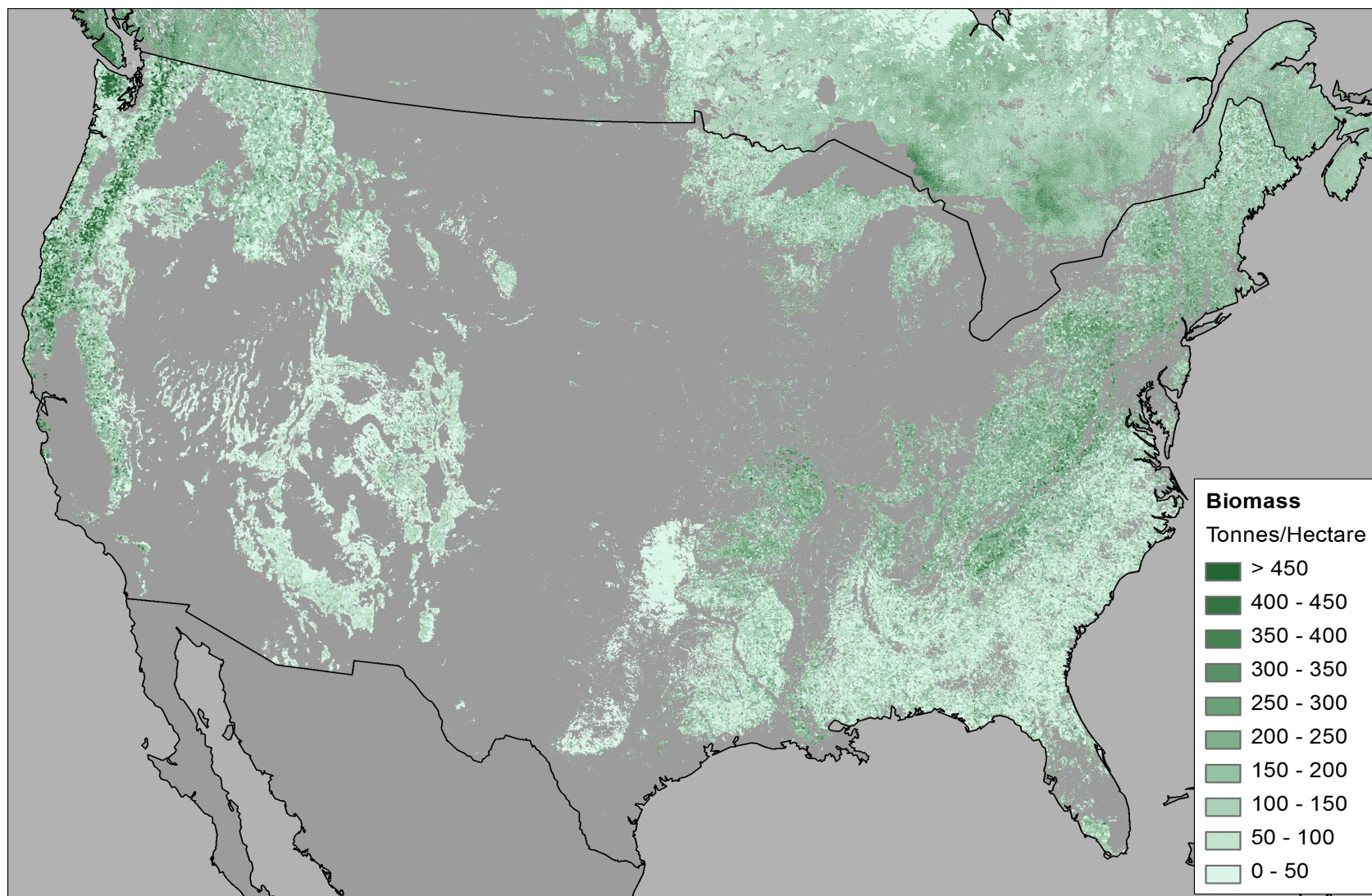


<http://geo.arc.nasa.gov/sgc/casa/cquestwebsite/>



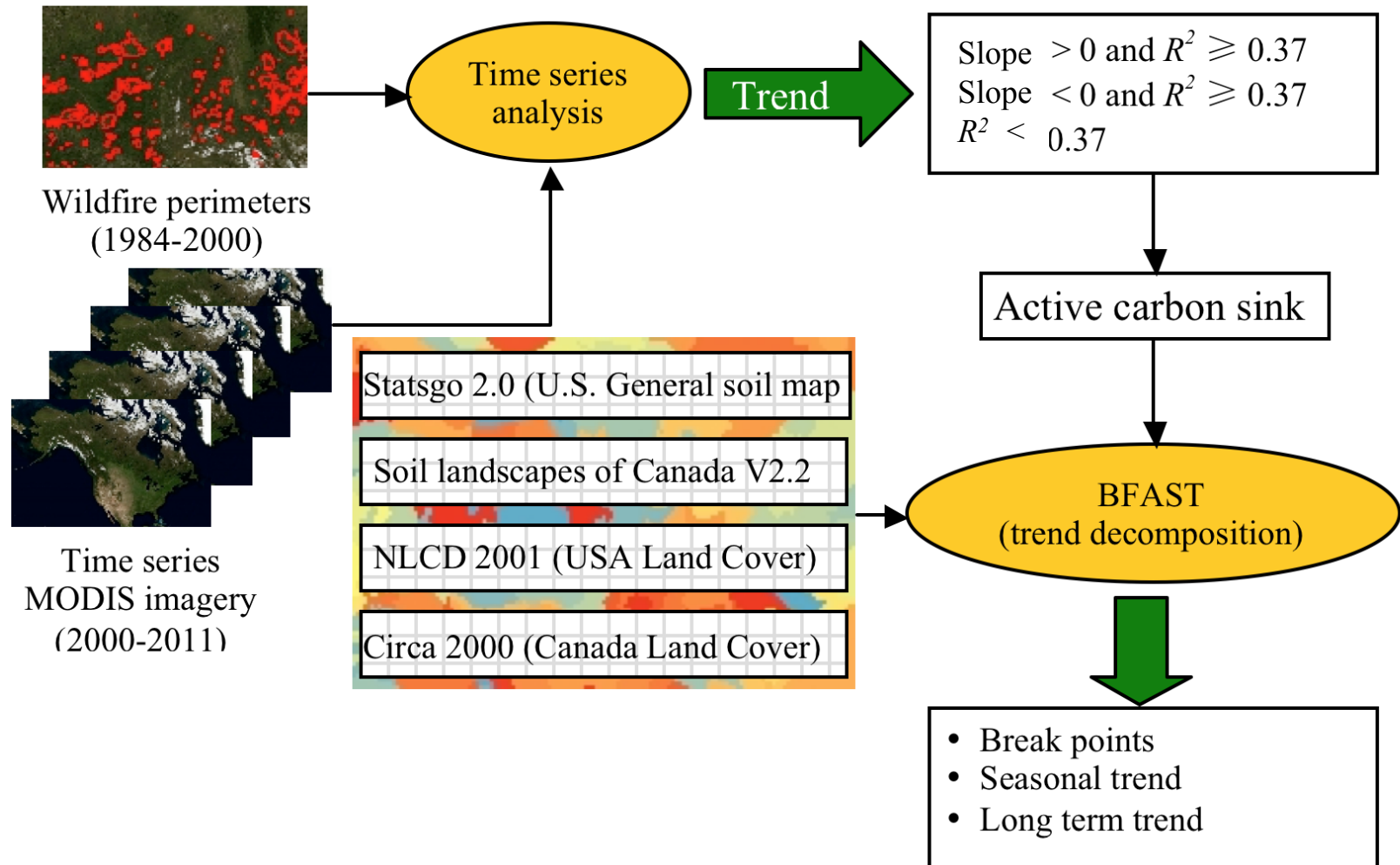
Storage of carbon in U.S. forests predicted from satellite data, ecosystem modeling, and inventory summaries

Climatic Change
DOI 10.1007/s10584-008-9462-5

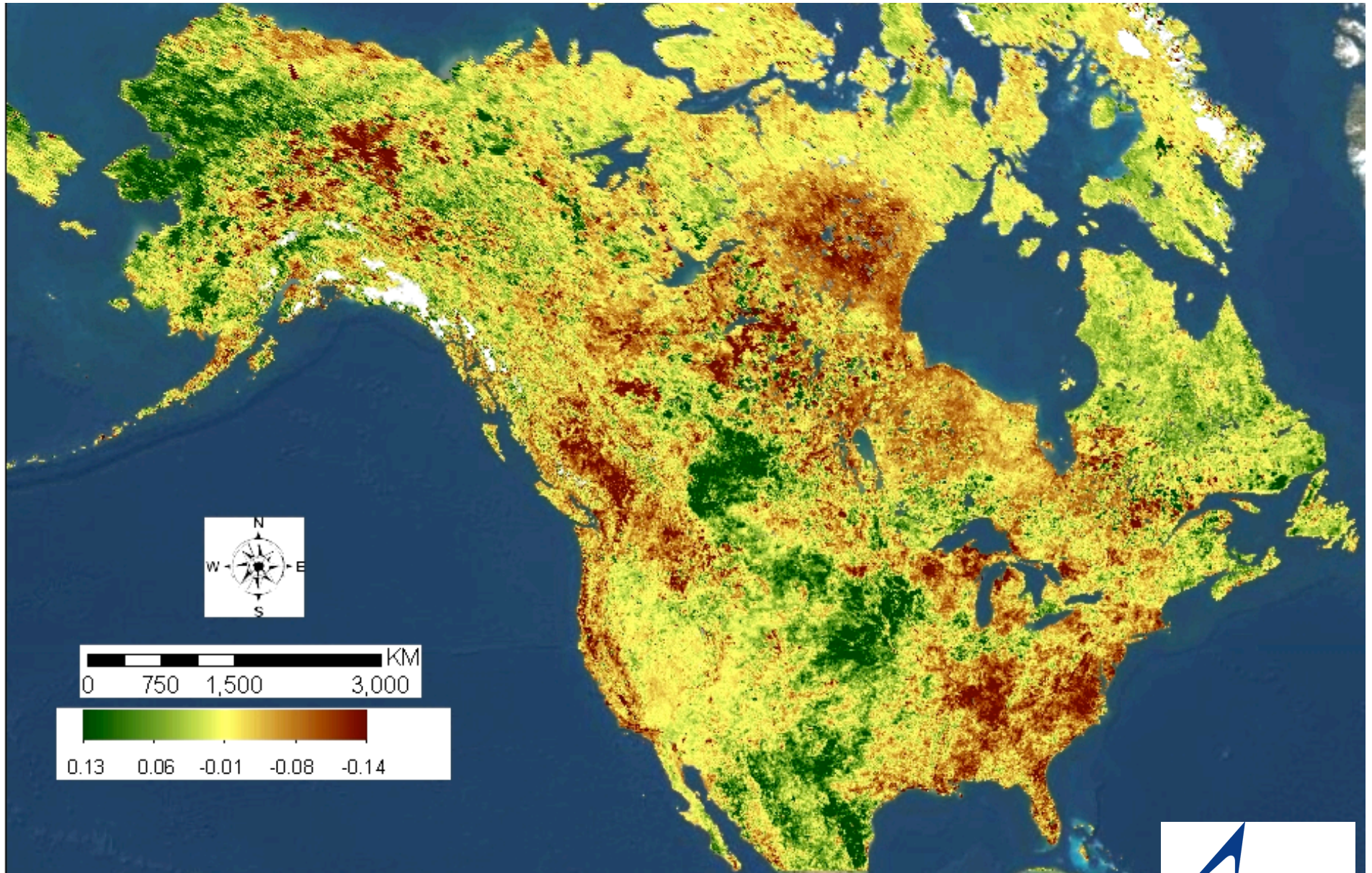


Methods and Computational Tools for MODIS VI Trend Analysis

(Source: Potter et al., 2012, *Natural Resources*)

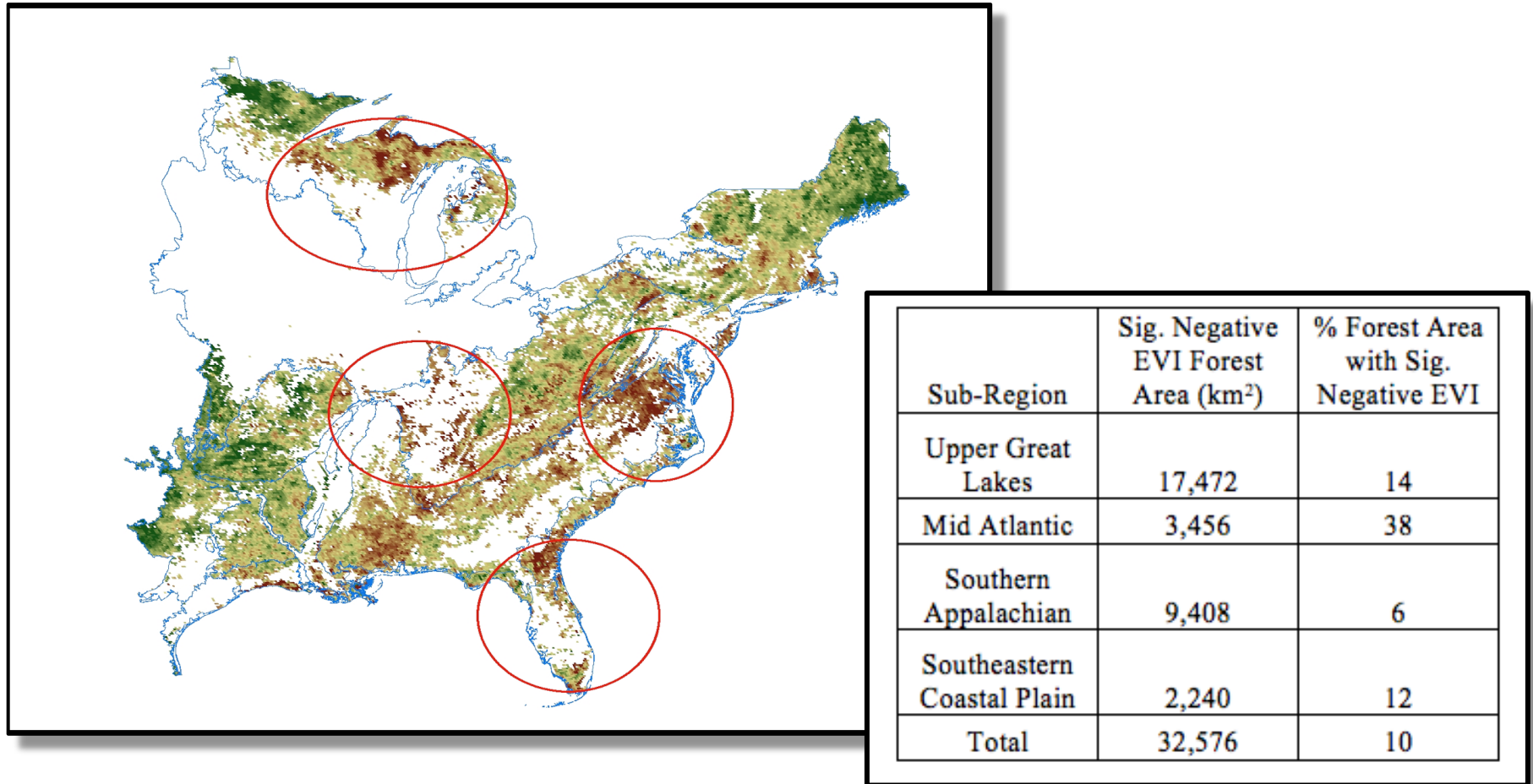


MODIS EVI Trend Results 2000-2011
(Source: Li and Potter, 2012, *Natural Sciences*)

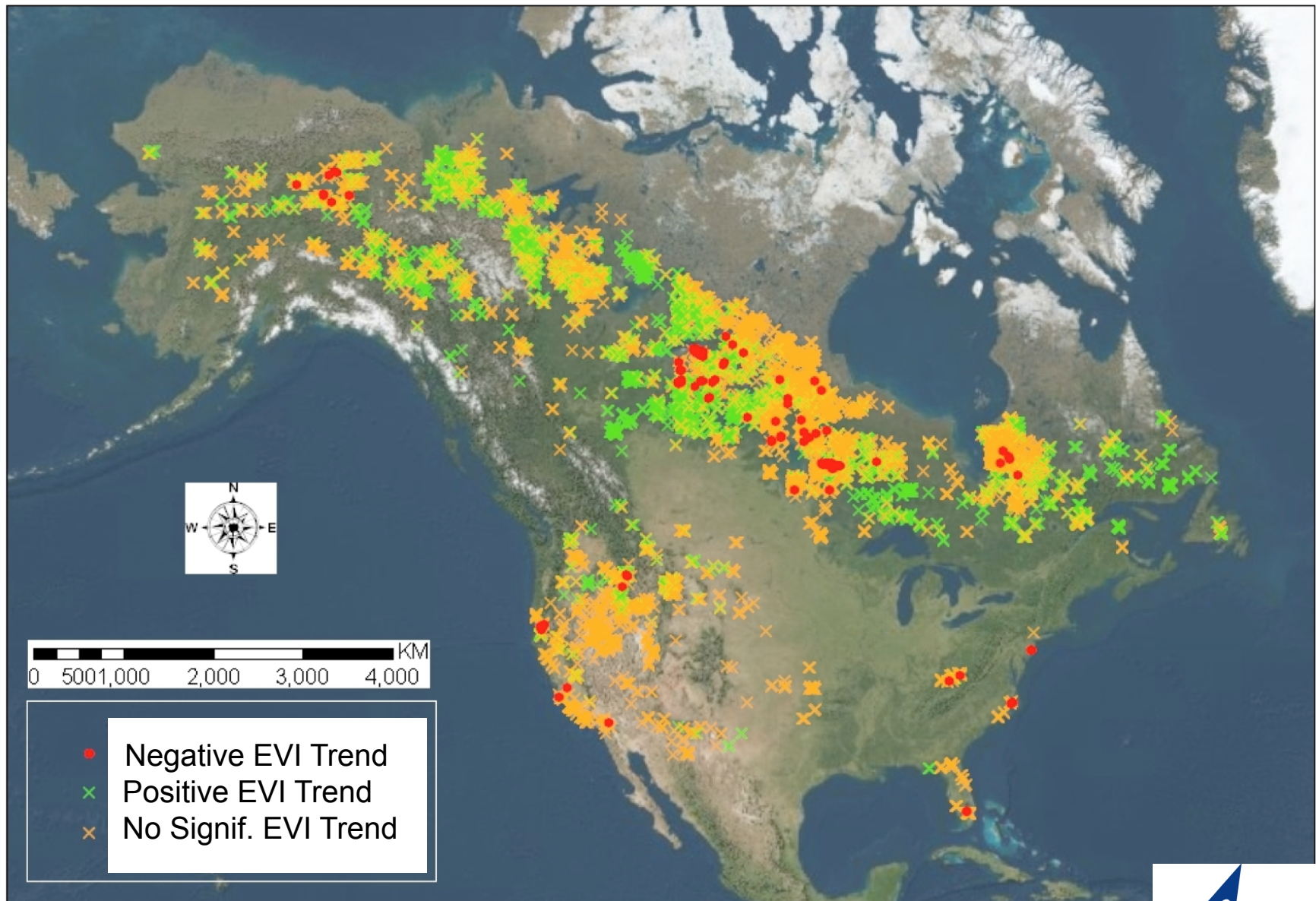


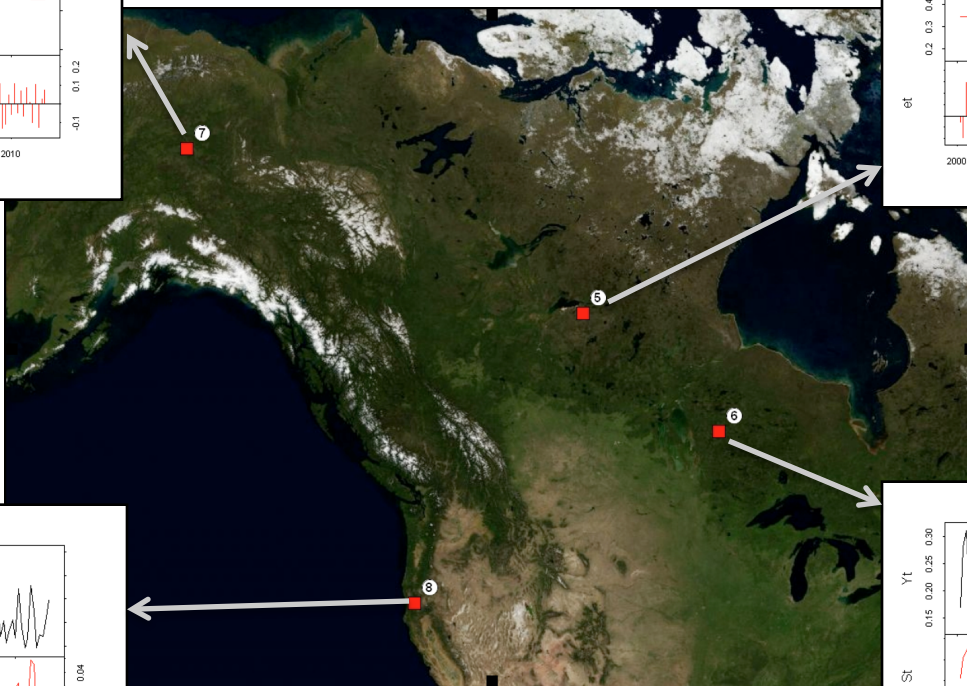
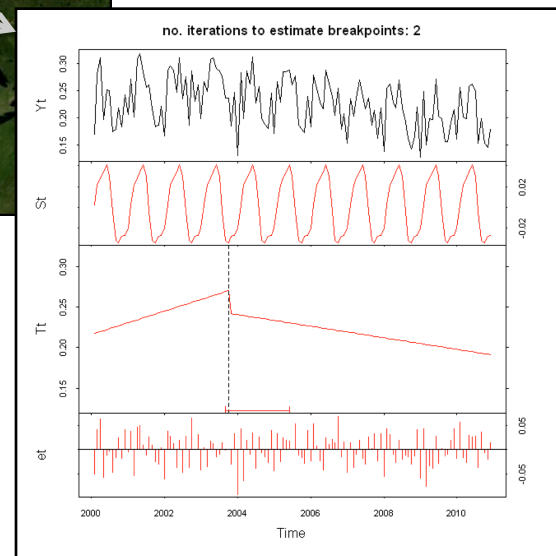
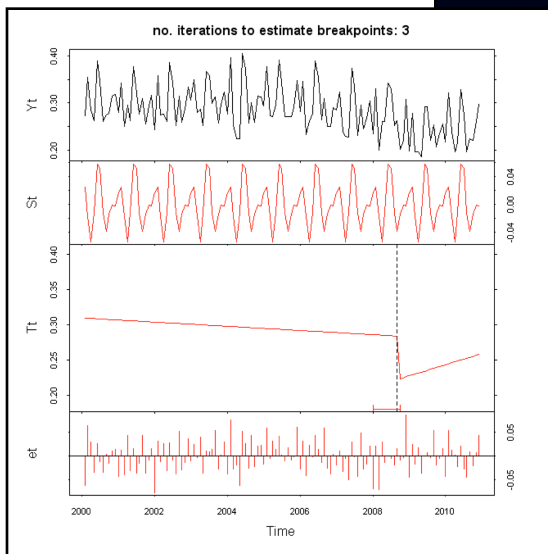
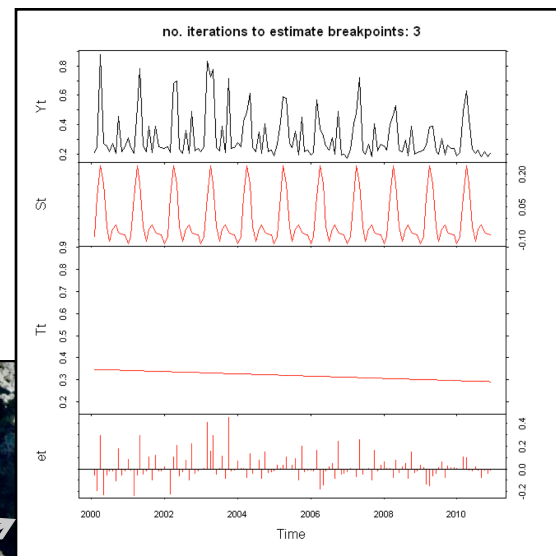
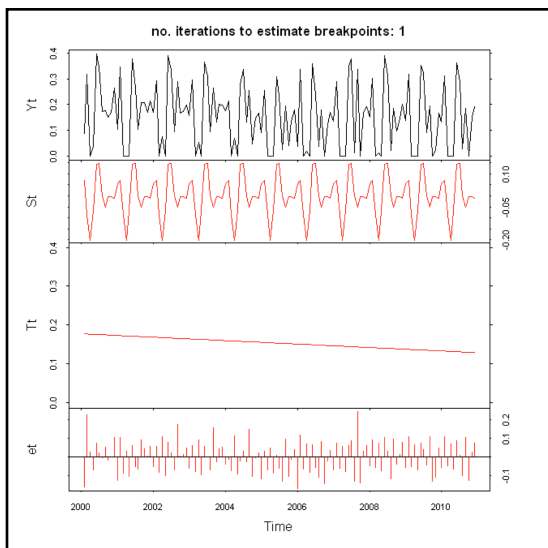
Declining Vegetation Growth Rates in the Eastern United States from 2000 to 2010

(Source: Potter et al., 2012, *Natural Resources*)



Preliminary MODIS EVI Trend Results 2000-2011 in Burned Forest Lands (Source: Li and Potter, 2012, *Natural Sciences*)





2012 Publications under NASA National Climate Assessment Program

Potter, C., S. Li, and C. Hiatt, 2012, Declining vegetation growth rates in the eastern United States from 2000 to 2010, *Natural Resources*, (in press).

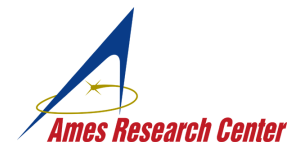
Li, S. and C. S. Potter, 2012, Vegetation regrowth trends in post forest fire ecosystems across North America from 2000 to 2010, *Natural Sciences*, doi:10.4236/ns.2012.

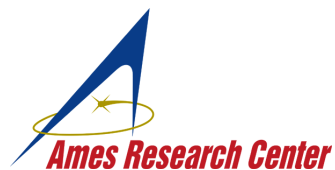
Potter, C., S. Klooster, and V. Genovese, 2012, Net primary production of terrestrial ecosystems from 2000 to 2009, *Climatic Change*, doi:10.1007/s10584-012-0460-2.

Potter, C., S. Klooster, V. Genovese, C. Hiatt, S. Boriah, V. Kumar, V. Mithal, and A. Garg, 2012, Terrestrial ecosystem carbon fluxes predicted from MODIS satellite data and large-scale disturbance modeling, *International Journal of Geosciences*, doi:10.4236/ijg.2012.

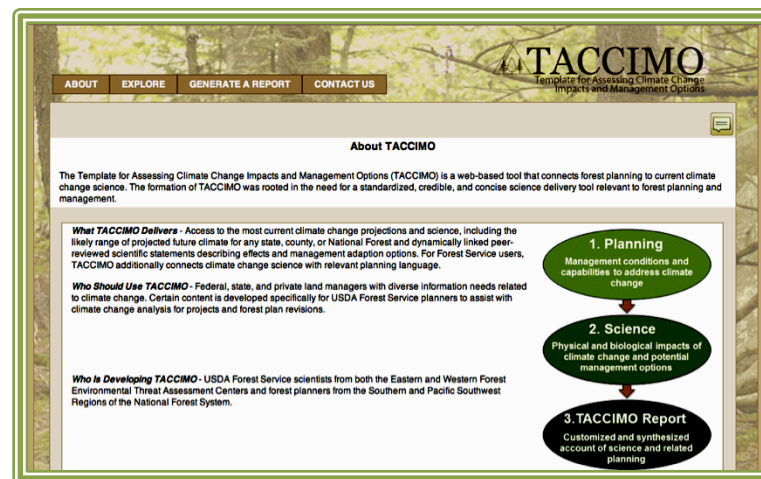
Huntzinger, D.N., et al., 2012, North American Carbon Program (NACP) regional interim synthesis: Terrestrial biospheric model intercomparison, *Ecological Modelling*, 232, 144-157.

Li, S., and C. S. Potter, 2012, Patterns of aboveground biomass regeneration in post-fire coastal scrub communities, *GIScience & Remote Sensing*, 49, 182-201.





NCA Partnership



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Featured Tools

Fuel Characteristic Classification System (FCCS)

FCCS quantifies and classifies wildland fuels in the United States and predicts their fire hazard. [Read more...](#)

Forest CarbonPlus Calculator

Water Supply Stress Index Model (WaSSI)

[CCRC Home](#) > [Climate Change and Carbon Tools](#)

Overview & Applicability

The WaSSI model is a tool that models local watershed stress by comparing water supply and demand in a particular area. The area is limited to a specific zipcode, which is linked to one of the 2100+ 8-digit **Hydrologic Unit Codes (HUCs)** in the lower 48 states, as defined by the US Geological Survey (USGS). WaSSI can be used to examine the historical water stress index for a given area, or can be used to predict future changes in water stress. The model incorporates natural and anthropogenic effects into its predictions of supply and demand. The modeling tool may be useful in facilitating integrated assessment of climate change adaptation and mitigation strategies across multiple watersheds and agencies, but would be substantially strengthened by the ability to forecast water stress across an integrated landscape larger than that defined by a zipcode (see Information on Tool Restrictions and Limitations, below).

Fast Facts

Website
<http://www.taccimogis.sgcp.ncsu.edu/WaSSI>

Topic
Hydrology

Purpose
The WaSSI model is an online modeling tool that allows a user to generate estimates of the historical, current, or future predicted water stress index for a particular zipcode. In reality, the water stress index outputs represent the predominant **Hydrologic Unit Code (HUC)** within a particular zipcode.

Output
The model output consists of a value which represents the "Water Supply and Stress Index" (WaSSI). This value is essentially a water balance (e.g. a ratio of water demand to water supply) for a particular zipcode, which is linked